

## Editorial

# Facet distraction-arthrodesis technique: Can it revolutionize spinal stabilization methods?

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Goel's facet distraction arthrodesis technique<sup>[1]</sup> presents a new philosophy and an alternative method of treatment of degenerative spinal canal stenosis<sup>[1,2]</sup> and opens up an entirely new and hitherto uncharted avenue of spinal stabilization.

The concept of facet distraction using specially designed "Goel facet spacers" for spondylotic spinal disease is based on the fact that the "age-related" or "instability related" facet overriding or telescoping may be an important component of pathogenesis of "spinal canal stenosis."<sup>[1,2]</sup> The technique of facet distraction essentially aims to restore the natural "anatomical spacing" of the spinal segments. The inherent tensile strength of the spinal segments firmly impacts the facet implant and obviates the need for any additional form of internal stabilization. The procedure ultimately results in arthrodesis of the affected spinal segments. Decompression of the spinal canal and root is achieved without removal or manipulation of any part of the disk, bone, or ligaments.

The unique standing human posture-related muscle weakness or incompetence of back extensor muscles leads to facet telescoping. Disuse atrophy of the muscles of the back secondary to sedentary life style or increasing age forms the basis of the spinal degeneration. Muscles have a role in keeping the spinal segments apart. Reduction of the interfacetal space and facet retrolisthesis appears to be an initial phenomenon that leads to a cascade of events like ligament buckling, subsequent osteophyte formation, and reduction in the spinal

canal and intervertebral root canal dimensions culminating into the so-called degenerative spinal canal stenosis. The disk changes essentially appear to be a reaction to the primary facet instability with only a secondary and possibly a protective role in the overall process of spinal degeneration. The observation that distraction of the facets potentially reverses all the known pathologic features seen in the spinal degeneration validates the concept that facet overriding may be the primary feature in spondylosis that leads to spinal canal stenosis.

The technique of facet distraction spacer arthrodesis is a rather straightforward and strong modality of spinal fixation. The stabilization of the spinal segment at the fulcrum of spinal movements provides biomechanical advantage to the fixation process. By distraction, the unique pattern of anatomical inclination of the facets at each spinal level can be used advantageously to restore the spinal alignment. Direct observation of the facets during surgery provides an opportunity for real-time assessment of instability that may not clearly be visualized on dynamic imaging. Facet distraction arthrodesis treatment is unaffected by and does not jeopardize any other form of anterior or posterior decompressive or stabilization surgical procedure. This fact can be advantageously used in failed decompressive surgery. All other described surgical procedures are possible when facet distraction arthrodesis has not produced the desired clinical result.

The term "degenerative stenosis" of the spine may be more aptly referred to as "spinal instability." The symptoms of spinal stenosis are generally related to activity that probably exhausts the muscles that hold the spinal segments apart. The "lumbar claudication pain" starts after walking for a distance. If the canal was stenosed, the symptoms would have been present at rest. The fact that symptoms begin after walking for a distance suggest that spinal telescoping is related to "vertical" instability that is secondary to muscle weakness.

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Telescoping of the spinal segment results in buckling of the intervertebral ligaments. Essentially the ligaments are buckled and not hypertrophied or degenerated. The reduction of the disk space height can be secondary to the facet arthrosis rather than being a primary phenomenon as has been discussed in the literature. Osteophyte formation occurs as a result of periosteal reaction along the intervertebral ligaments. The disk space height and "disc water content" are potentially reversible following facet distraction. Anterior, lateral, and posterior intervertebral ligamentous buckling can reverse following surgery.

Extension of surgery for multilevel treatment is relatively a straightforward maneuver. Multilevel surgery by anterior cervical route can not only be tedious but can also subject critical nerves and blood vessels and trachea-oesophageal complex to risk of injury. Facet distraction arthrodesis is a rather safe surgical procedure. There is no need to expose the spinal cord or dura. The vertebral artery and the spinal roots are strategically placed and are safe during the process of facet distraction.

Our 23-year experience of opening and manipulating the C1-2 joint<sup>[3,4]</sup> and our 12- year experience with "joint jamming" technique,<sup>[5]</sup> wherein we introduce a specially designed spacer within the articular cavity of C1-2 joint, have provided us an opportunity to evaluate the dynamics and importance of the joints in the stabilization of the spinal segments. Denuding the articular cartilage and bone grafting within the facet joint provides an opportunity of stabilization at the point of fulcrum of spinal movement. Although fixation of the facets has been discussed, utilization of the joint surface in the provision of arthrodesis is only rarely advocated. Additional bone graft placement over the laminae increases the space available for bone fusion. The process of opening of the joints also provides an opportunity to manipulate the facets. Such a maneuver can be useful in cases with facet locking and similar such situations. We have effectively used the process of manipulation of facets in the treatment of basilar invagination,<sup>[6,7]</sup> irreducible atlantoaxial dislocation,<sup>[8]</sup> and rotatory atlantoaxial dislocation.<sup>[9]</sup> We have observed that subtle instability and reduction of the joint space have a role in buckling of posterior longitudinal ligament and subsequent osteophyte formation at the craniovertebral junction.<sup>[10]</sup> Distraction of the C1-2 facets provides an opportunity to treat anteriorly placed compressive lesions without directly handling them. Lateral mass height reduction or even a lateral mass collapse as seen in rheumatoid arthritis that affects

craniovertebral junction can result in marked posterior buckling of posterior longitudinal ligament, referred to as pannus.<sup>[11-13]</sup> Facet distraction can lead to immediate postoperative reduction or even disappearance of the "pannus."<sup>[13]</sup>

Facet distraction arthrodesis provides not only an avenue for firm stabilization of the spine but also has the potential of reversal of several events that are related to spondylosis and other pathologic entities. The facet opening, distraction, and manipulation and fixation can be an effective tool in the armamentarium of a spinal surgeon.

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